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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,935	06/20/2003	Masud Mansuripur	UA 02-023	6190

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EXAMINER	
NEGIN, RUSSELL SCOTT	
ART UNIT	PAPER NUMBER
1631	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/600,935	MANSURIPUR ET AL.	
	Examiner	Art Unit	
	Russell S. Negin	1631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-71* is/are pending in the application.

4a) Of the above claim(s) *5,28,29 and 40-63* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-13,17,21-26,30-39,64 and 71* is/are rejected.

7)☒ Claim(s) *14-16,18-21,27 and 65-71* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/13/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Comments

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 24-73 have been renumbered 22-71, respectively.

Election/Restrictions

Applicant's election with traverse of Group I in the reply filed on 22 November 2006 is acknowledged. The traversal is on the ground(s) that newly amended claim 42 from Group II and claim 43 form Group III contain the limitations of the independent claim in Group I (claim 1). Therefore, the restriction is not proper. This is not found persuasive.

In this case, Groups II and I are related as a process of making and product made. In the restriction requirement of 17 October 2007, it was shown that the product of Group I could be made by a materially different method than that of Group II. Even though the claim 42 now incorporates claim 1 in its preamble, the basis of the restriction still holds. The invention of Group I can be produced form a different process than that stated in Group II.

Furthermore, Groups III and I are related as a process and an apparatus for its practice. In the restriction requirement of 17 October 2007, it was shown that the product of Group I could be used as a materially different method than that of Group III. Even though the claim 43 now incorporates claim 1 in its preamble, the basis of the restriction still holds. The invention of Group I can be used in a different process than that stated in Group III.

For the inventions in Groups I and II, the following should be noted:

The examiner has required restriction between product and process claims. Where applicant elects claims directed to the product, and the product claims are subsequently found allowable, withdrawn process claims that depend from or otherwise require all the limitations of the allowable product claim will be considered for rejoinder. All claims directed to a nonelected process invention must require all the limitations of an allowable product claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product are found allowable, an otherwise proper restriction requirement between product claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product claim will not be rejoined. See MPEP § 821.04(b). Additionally, in order to retain the right to rejoinder in accordance with the

above policy, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product claims. **Failure to do so may result in a loss of the right to rejoinder**. Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

The requirement is still deemed proper and is therefore made FINAL.

Claims 40-63 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 22 November 2006.

Applicant's election without traverse of species A-2, B-1, and C-2 in the reply filed on 22 November 2006 is acknowledged.

Claims 5, 28 and 29 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 22 November 2006.

Claims examined in this Office action are claims 1-4, 6-27, 30-39, and 64-71.

Priority

Applicant did not properly claim benefit to nonprovisional application 60/391639. According to CFR 1.78(a)(iii) of the MPEP:

> If the later-filed application is a nonprovisional application, the reference required by this paragraph must be included in an application data sheet (§ **1.76**), or the specification must contain or be amended to contain such reference in the first sentence(s) following the title.

In this instance, the claim of benefit does not directly follow the title of the invention in the specification.

Information Disclosure Statement

The information disclosure statement of 13 August 2003 contains three non-patent literature articles without dates on the articles or in the IDS. Accordingly, these references (Lipshutz et al., Southern et al., and "The Flow of Wet Water") are not considered as part of the IDS.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In this instant, claim 8 requires "at least one reservoir," (i.e. singular or plural). However, the claim ends by returning the molecules to "the reservoir." It is consequently unclear as to the antecedent basis of the term "the reservoir" where it is previously referred to as "at least one reservoir." The metes and bounds of this claim need to be clarified.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

35 U.S.C. 103 Rejection #1:

Claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al. [Scientific American, volume 253, 1985, pages 48-56] in view of Rothemund [US Patent 5,843,661] in view of Lackritz et al. [US Publication 2002/0056639].

Claims 1-2, 10, 17, 22 and 26 state:

> 1. A storage device, comprising: a write head that encodes strands of molecular material with sequences of binary data; a storage block for storing the strands; a read head for reading out a sequence of binary data from a selected strand; and a transport mechanism that moves the strands between the read and write heads and the storage block.

2. The storage device of claim 1, wherein the strand includes a number of molecular bases that are encoded with the binary data, said read head detecting each base or collection of the bases within the strand to read out the binary data directly from the strand.

4. The storage device of claim 2, wherein the read head comprises: A chamber that closely confines a strand as it moves therethrough, and A microscopic probe held in close proximity to the passing strand such that the probe interacts with each base or collection of bases and produces a signal indicative of the binary data encoded therein.

7. The storage device of claim 1, wherein said read and write heads and said storage block are integrated, on a substrate, further comprising: at least one reservoir of molecular material located off-substrate that feeds molecular, material to the write head; and a dump located off-substrate for receiving the disposed strand.

8. The storage device of claim 1, wherein said read and write heads and said storage block are integrated on a substrate, further comprising: at least one reservoir of molecular material located on the substrate that feeds material to the write head; and a recycle unit located on the substrate for receiving the disposed strand, breaking the strand into molecules, and returning them to the reservoir.

9. The storage device of claim 1, wherein the storage block comprises: a plurality of parking lots for storing the strands; a respective plurality of actuated gates that control the strands entrance, to and exit from the respective parking lots and read and write heads, said actuated gates having unique addresses and being controlled by an external signal; and a race track that is connected to the parking lots via the actuated gates and acts as a highway for transporting the strands.

10. The storage device of claim 1, wherein the write head receives blank strands and modifies the strands to encode the binary data.

11. The storage device of claim 1, wherein the write head receives distinct molecular bases and synthesizes them into strands to encode the binary data.

12. The storage device of claim 1, wherein the write head encodes the binary data into the base-sequence of the strand.

13. The storage device of claim 1, wherein the write head uses the strand as a support structure on which to encode the binary data.

17. The storage device of claims 10, wherein the blank strand comprises molecular bases having at least two states, the write head comprising: an activator that transforms the bases into one of its states; and a transport mechanism that pulls the strand past the activator to write the sequence of binary data into the strand.

22. The storage device of claim 1, further comprising a plurality of said read and write heads that address the storage block in parallel.

23. The storage device of claim 1, wherein the strands are electrically charged, said transport mechanism comprising a pair of electrodes that establish an electric field gradient that pull the strands around.

25. The storage device of claim 1, wherein the strands reside in a liquid, said transport mechanism comprising one or more micro-fluidic pumps that induce a flow current in the liquid

that moves the strand.

26. The storage device of claim 1, wherein the molecular material is DNA having bases of adenine (A), thymine (T), cytosine (C) and guanine (G).

30. A storage device, comprising: a patterned substrate having a network of liquid-filled canals; and strands of molecular material encoded with a sequence of binary data in the liquid-filled canals and movable therein between different locations on the substrate.

31. The storage device of claim 30, further comprising: a plurality of micro-fluidic valves that control access to the stored strands in addressable locations; and a transport mechanism that moves the strands around in the liquid-filled canals.

32. The storage device of claim 31, wherein the strands are electrically charged, said transport mechanism comprising electrodes that establish an electric field gradient in the network of liquid-filled canals that pull the strands through the canals.

34. The storage device of claim 33, wherein the transport mechanism comprises at least one micro-fluidic pump that induces a current in the liquid-filled canals that moves the strands.

35. The storage device of claim 30, further comprising a write station having an inlet for receiving molecular bases, a write head that synthesizes the bases into strands so that a particular sequence of binary data is encoded in a base-sequence of the strand, and an outlet that directs the strand into the network of liquid-filled canals.

36. The storage device of claim 30, wherein the strand comprises a number of bases or collections of bases encoded with the binary data, further comprising a read station that includes an inlet valve for receiving a strand from the liquid-filled canals, a read head for detecting each base or collection of bases to read out the binary sequence directly from the strand, and one or more outlets for disposing of the molecular material.

39. A storage device, comprising: a patterned substrate having a network of liquid-filled canals that define parking lots and a racetrack; a write station that synthesizes distinct molecular bases in-situ into strands to encode a sequence of binary data in the base-sequence of the strand; a read station that detects bases or collections of bases to read out the binary data sequence directly from the strand; a plurality of micro-fluidic valves that control access to the parking lots and read and write stations in response to an external signal; and a transport mechanism that moves the strands between the parking lots and the read and write stations via the network of liquid-filled canals.

Claim 64 is an analogous storage device dependent from claim 10 where in the material includes at least two distinct bases, with a write head comprising a given set of conditions.

The article of Bennett et al., entitled, "The fundamental physical limits of computation," describes an enzymatic Turing machine on page 55 which states as its caption:

[This enzymatic Turing machine] could perform a computation with no minimum expenditure of energy. Molecules representing 0 and 1 bits are attached at periodic intervals to a backbone

> molecule. A small additional molecule, representing the Turing machine's head, is attached to the 0 or 1 group at one site on the chain (1). There are several types of head molecule, each type representing a different internal machine state. Transition rules are represented by enzymes. In each cycle an enzyme attaches itself to the head molecule and the bit molecule to which the head is attached (2); then it detaches them from the chain, putting in their place the appropriate bit molecule (3). As it does so it rotates, so that it attaches the appropriate head molecule to the bit molecule that occupies the site one notch to the right or left of the bit it has just changed. Now the cycle is complete (4); the value of a bit has been changed, and the head has changed state and shifted its position. Each kind of enzyme is able to catalyze one such set of reactions. As in the case of RNA synthesis, these reactions can be made to dissipate an arbitrarily small amount of energy.

Consequently, Bennett et al. teaches write and read heads in the form of enzymes that encodes strands with binary data.

However, Bennett et al. does not teach a storage device for DNA. In addition, Bennett et al. does not teach the storage block for storing the strands, or the transport mechanism for moving strands.

The patent of Rothemund, entitled, "Method for construction universal DNA based molecular Turing machine," states in its abstract:

> This invention discloses a novel method for constructing a Universal based Turing machine. Included in the invention is a method of operating the DNA based Turing machine of this invention.

The summary of the invention in column 6, lines 53-57, state:

> The present invention describes a universal molecular DNA Turing machine. The Turing machine of the present invention is encoded with oligonucleotides and transitions are effected using restriction enzyme chemistry. The present invention also includes a method of operating the universal Turing machine.

The background of the invention states that Turing machines can be molecular machines that support a four-letter alphabet {A, C, G, and T} instead of a binary tape, and act as a powerful molecular computer.

Rothemund elaborates on parallel computation in column 7, lines 32-39 which states:

> The Turing machine of the present invention can be operated to solve only one problem, in which case every DNA molecule/tape is identical and encodes the same computation. The Turing machine of the present invention can also be operated to solve more than one problem simultaneously. In this case there are a number of different DNA molecules/tapes, each of which encodes a separate computation.

However, the above-mentioned sources do not teach the storage block for storing the strands, or the transport mechanism for moving strands.

The article of Lackritz et al., entitled, "Methods and devices for conducting electrophoretic analysis," states in its abstract:

> Capillary electrophoresis is performed under conventional conditions in microchannels having a norborene based polymer surface. The norborene based polymers can be used as a solid substrate for forming necessary features for a microfluidic device, where the entire device may be made or norborene based polymer. Conveniently, a norborene based polymer layer having a lower glass transition temperature may be used to adhere a cover or enclosing layer to the substrate to enclose microchannels and provide a bottom for the reservoirs.

Consequently, the cover figure shows a transport mechanism with multiple channels (i.e. canals) and reservoirs (i.e. parking lots) for transporting, holding or recycling oligonucleotides. The purpose of the invention is described in paragraph [0003] of the application of Lackritz et al.:

> Capillary electrophoresis (CE) has been gaining increasing utility for conducting chemical and biochemical operations. It provides many benefits including substantial savings in time of analysis, automation and high throughput. These benefits are due in great part to miniaturization and the alleviation of associated human factors, e.g. labor costs, costs associated with operator error, and general inconsistencies from individual to individual and overall human operation.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify the enzymatic Turning machine of Bennett et al. in view of the DNA Turning machine of Rothemund in view of electrophoretic analysis of Lackritz et al. because while the enzymatic Turing machine of Bennett et al. provides

the necessary binary data, the Turning machine of Rothemund provides a more computationally intense machine that is able to compute in parallel and that is based on the four nucleotides of DNA, and the capillary electrophoresis system of Lackritz et al. provides a more detailed venue to expeditiously and conveniently transport DNA through microchannels between multiple reservoirs.

35 U.S.C. 103 Rejection #2:

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Meller et al. [Physical Review Letters, April 2001, volume 86, pages 3435-3438].

Claims 1-3 state:

> 1. A storage device, comprising: a write head that encodes strands of molecular material with sequences of binary data; a storage block for storing the strands; a read head for reading out a sequence of binary data from a selected strand; and a transport mechanism that moves the strands between the read and write heads and the storage block.
>
> 2. The storage device of claim 1, wherein the strand includes a number of molecular bases that are encoded with the binary data, said read head detecting each base or collection of the bases within the strand to read out the binary data directly from the strand.
>
> 3. The storage device of claim 2, wherein the read head comprises: First and second chambers, which have a shared wall and contain a liquid, A nano-pore in the shared wall; A voltage source that applies a voltage across said first and second chambers thereby producing an ionic current that flows through the nano-pore and pulling strands through the nano-pore as they are presented to the first chamber; and A current meter that measures fluctuations in the ionic current as each base or collection of bases in the strand flows through the nano-pore.

Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above fail to teach use of a current meter to monitor ionic current through a nanopore.

The study of Meller et al., entitled "Voltage-Driven Translocations through a nanopore," measures current of DNA through a nanopore in Figures 1 and 2. Meller et al. state in their abstract:

> We measure current blockade and time distribution for single-stranded DNA polymers during voltage-driven translocations through a single alpha-hemolysin pore. We use these data to determine the velocity of the polymers in the pore.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Meller et al. because Meller et al. monitor ionic current through nanopores in order to measure the velocity of DNA through the microchannels.

35 U.S.C. 103 Rejection #3:

Claims 1, 24, 30-31, 33, and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Wang et al. [US PGPUB 2002/0181837].

Claims 24, 33, and 37-38 state:

> 24. The storage device of claim 1, wherein the transport mechanism comprises a laser that forms optical tweezers that grab the strand and pull it around.
>
> 33. The storage device of claim 31, wherein the transport mechanism comprises a laser that forms optical tweezers that grab the strands and pull them through the liquid.
>
> 37. The storage device of claim 31, wherein the micro-fluidic valves, comprise: an inlet; first and second outlets; a switch block; and an actuator that moves the switch block back-and-forth to alternately block said first and second outlet.
>
> 38. The storage device of claim 31, wherein the micro-fluidic valves, comprise: an inlet; first and second outlets; a switch block; and an actuator that moves the switch block back-and-forth to alternately.

Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, fail to teach using optical tweezers to control movement of the particles in the fluid, or use of a switching block.

The invention of Wang et al., entitled, "Optical switching and sorting of biological samples and microparticles transported in a micro-fluidic device, including integrated bio-chip devices," illustrates in the cover figure how light is used to trap particles and control the fluidic channels to which the microparticles travel.

The purpose of the invention, as stated in paragraph [0037] of the application is to regulate flow through microchannels, using two distinct types of forces simultaneously.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Wang et al. because Wang et al. has the advantage of controlling the paths of nanoparticles using both microfluidics and light simultaneously for convenience to the user.

35 U.S.C. 103 Rejection #4:

Claims 1, 2, 4, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Lee et al. [US Patent 6,905,586].

Claim 6 states:

> 6. The storage device of claim 4, wherein the microscopic probe comprises an atomic force microscope tip that deflects when held in close proximity to a base or collection of bases.

Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, fail to teach using AFM to analyze sequences.

The invention of Lee et al., entitled, "DNA and RNA sequencing by nanoscale reading through programmable electrophoresis and nonelectrode-gated tunneling and dielectric detection," states in its abstract:

> An apparatus and method for performing nucleic acid (DNA and/or RNA) sequencing on a single molecule. The genetic sequence information is obtained by probing through a DNA or RNA molecule base by base at nanometer scale as though looking through a strip of movie film. This DNA sequencing nanotechnology has the theoretical capability of performing DNA sequencing at a maximal rate of about 1,000,000 bases per second. This enhanced performance is made possible by a series of innovations including: novel applications of a fine-tuned nanometer gap for passage of a single DNA or RNA molecule; thin layer microfluidics for sample loading and delivery; and programmable electric fields for precise control of DNA or RNA movement. Detection methods include nanoelectrode-gated tunneling current measurements, dielectric molecular characterization, and atomic force microscopy/electrostatic force microscopy (AFM/EFM) probing for nanoscale reading of the nucleic acid sequences.

Consequently, Lee et al. use AFM to sequence DNA via microfluidics with the aid of AFM.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify Bennett et al. in view of Rothemund in view of Lackritz et al., as applied to claims 1-2, 4, 7-13, 17, 22-23, 25-26, 30-32, 35-36, 39 and 64 above, in further view of Lee et al. because Lee et al. has the advantage of employing microfluidics and AFM simultaneously to sequence oligonucleotides.

Allowable Subject Matter

Claims 14-16, 18-21, 27, and 65-71 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the central PTO Fax Center. The faxing of such pages must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center Number is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Negin, Ph.D., whose telephone number is (571) 272-1083. The examiner can normally be reached on Monday-Friday from 7am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Ram Shukla, Supervisory Patent Examiner, can be reached at (571) 272-0735.

Information regarding the status of the application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information on the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RSN
14 April 2007

4/14/07

16 April 2007

JOHN S. BRUSCA, PH.D
PRIMARY EXAMINER